Chapter 10
Non-timber Forest Products and Conservation: What Prospects?

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Abstract Non-timber forest products (NTFPs) were hailed as a "silver bullet" to provide the economic incentives to conserve standing forests while contributing to local livelihoods. While the livelihood benefits of NTFPs have been widely acknowledged, the contribution of the NTFP sector to biodiversity conservation is less certain. Despite increasing skepticism of the ability of NTFPs to contribute to conservation, their promotion and development remains a readily implemented tool for many site level conservation projects. However, this chapter dispels certain assumptions related to NTFP sustainability and the links between NTFP extraction systems and conservation. We conclude that the links are generally tenuous to say the least and suggest that perceptions of the relative value of NTFPs in terms of biodiversity conservation need to be revised.

10.1 Introduction

In the late 1980s, non-timber forest products (NTFPs) were mooted as a potential alternative to deforestation and other land conversion activities (Falconer 1990; Plotkin and Famolare 1992). Some NTFPs have a significant market value and it was postulated that the long-term value accruing from the sustainable harvest of these products could override the short-term gain of converting that forest or individual

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trees to other intensive uses such as timber, agriculture, or plantations (Peters et al. 1989; Godoy and Bawa 1993).

From a biodiversity conservation and livelihood development perspective, it is a compelling concept. Local people live in harmony with nature, deriving their livelihood and subsistence needs from the forest while actively protecting and ultimately sustainably utilising the "subsidy from nature" (Hecht et al. 1988: 25). The concept of the "rainforest harvest" (Prance 1992: 21) was rooted heavily in the extractivist culture of Latin America where rubber and Brazil nuts, amongst other non-timber commodities, are harvested in forested landscapes and sold to established markets, providing material and subsistence needs for local inhabitants. The formal recognition of extractive reserves as a legal entity was a direct result of lobbying from the National Council of Rubber Tappers (CNS), established in 1985 as a result of considerable social unrest related to land use in Amazonia (Richards 1993). The appeal of such extractive systems began to be realised, and in the late 1980s, a number of influential studies were published almost simultaneously, waxing eloquence about the possibilities to save the tropical forests of the world through sustainable use that provided an economic alternative to timber exploitation or other destructive land uses such as agricultural conversion (Gradwohl and Greenberg 1988; Hecht et al. 1988; de Beer and McDermott 1989; Fearnside 1989; Peters et al. 1989). This optimism was further endorsed through the purported potential commercialisation of forest products, including medicinal plants (Farnsworth 1988; Nepstad and Schwartzman 1992; Panayotou and Ashton 1992; Plotkin and Famolare 1992) that would contribute to local livelihoods, and by increasing the value of tropical forests, their conservation would be guaranteed (Godoy and Bawa 1993). The bottom line was that rainforests were perceived to have the ability to pay for themselves (Peters et al. 1989) and the expression "use it or lose it" (Freese 1997: 1; Struhsaker 1998: 930; Putz et al. 2001: 7) entered the parlance of the day. The underlying principle was that if the forest had no immediate value, it would be converted to other, more productive, land uses; hence, the sustainable use of NTFPs became regarded as a direct means of affording protection to standing forest.

However, 20 years later the original optimism surrounding the prospects for NTFPs to contribute substantially to both conservation and development has been significantly tempered (Chap. 2), particularly in the academic community (Arnold and Ruiz-Pérez 2001; Ros-Tonen and Wiersum 2005; Kusters et al. 2006; Belcher and Schreckenberg 2007). Much of this early optimism was based on claims of economic potential (de Beer and McDermott 1989; Peters et al. 1989; Godoy et al. 2000) which have been described as over-simplistic assessments of "value" (Southgate et al. 1996; Sheil and Wunder 2002). These shortfalls have been combined with limited understanding and evaluation of the complexity of political, economic, social, and market-oriented issues surrounding NTFP harvesting and trade (Dove 1995; Lawrence 2003). Increased commercialisation of forest products for promoting conservation and development has also been questioned as a means to contribute to both conservation and development objectives (Marshall et al. 2003), and it is argued that many households barely cover the opportunity costs of collection (Southgate et al. 1996). For example, even for high-value forest

products, the majority of income accrues to those who transform the product, usually the wealthier members of the society (Alcorn 1995), local elites who control the market, or the state (Dove 1993; Richards 1993; Struhsaker 1998; Ros-Tonen and Wiersum 2005). Despite this, NTFP development and promotion continue to underpin many conservation efforts in the field, particularly in the implementation of integrated conservation and development projects (ICDPs) (Kiss 2004), and the potential for NTFPs to contribute to forest conservation and poverty alleviation is still being debated in the contemporary literature (see, for example, id21 Forestry Insights, issue 77, May 2009: http://www.id21.org/insights/insights77/index.html).

In this chapter, we review the early prospects for NTFP-based systems for sustainable forest management and whether or not biodiversity conservation goals can be achieved within such systems. In this context, we discuss not only the ecological and biological constraints related to NTFP sustainability but also some of the political and socioeconomic drivers that compromise the ability of NTFPs to contribute significantly to wider biodiversity conservation, particularly in the forested regions of the humid tropics.

10.2 NTFPs and Rural Livelihoods

Before discussing the potential of NTFP harvesting to contribute to tangible biodiversity conservation outcomes, it is important to recognise the valuable contribution that such products make to rural (and urban) livelihoods. Many authors highlight just how important NTFPs are to the local economy and livelihoods (de Beer and McDermott 1989; Nepstad and Schwartzman 1992; Prance 1992, 1998; Colfer 1997; Shanley et al. 2002, 2008; Belcher and Schreckenberg 2007; Paumgarten and Shackleton 2009). In many rural locations, particularly in areas that lack basic infrastructure and market access, the collection of NTFPs provides considerable subsistence support to local livelihoods through the provision of food, medicines, and plants and animals of cultural importance (Chap. 3; Fig 10.1).

Fig. 10.1 The start of a storage basket from *Papyrus* sp., harvested in Bigodi Wetland Sanctuary, and community initiative, Bigodi, Uganda (photo: Claire Shackleton)

When certain products are sold, this provides direct, and often the only means of access to the cash economy (Ros-Tonen and Wiersum 2005). In many instances, the trade in NTFPs has reached such levels that the chain of beneficiaries is long and complex (Belcher and Kusters 2004). There are many examples of such systems: the Brazil nut trade in Amazonia (Ortiz 2002), the trade in *Prunus africana* from African montane forests for the herbal medicinal industry (Ndam and Tonye 2004), the international rattan trade from southeast Asia and Africa (Sunderland and Dransfield 2002), the trade of cardamom (*Amomum villosum*) from the Lower Mekong region (Aubertin 2004; Tu 2004), and the harvest of palm fronds from Guatamala for the floriculture trade (Guariguata et al. 2008) to name but a few (see Chaps. 3–6 for more). In addition, Tabuna (1999) highlights that the strength of the trade in Central African NTFPs has led to substantial marketing of these products for the African diaspora based in Europe. Hence, it is clear that there are substantial livelihood and cash benefits from the harvest and trade in NTFPs, but how does this subsistence or economic value contribute to conservation of the wild resource or biodiversity in general?

10.3 Is the Harvesting of NTFPs Sustainable?

Underpinning the NTFP conservation and development debate is an assumption that NTFP harvest is inherently, or can potentially be, sustainable and ecologically more benign than alternative economic activities (such as timber exploitation) or non-forest utilisation (such as agricultural conversion) (Arnold and Ruiz-Pérez 2001; Putz et al. 2001; Ruiz-Pérez 2005; Chap. 7). Sustainability is a complex concept and there are many definitions of what sustainable means (Ostrom 2009; Tovey 2009). For example, in the case of NTFPs it is necessary to highlight the differences between ecological and economic sustainability, as the two are not always consistent (Hall and Bawa 1993). Over-harvesting of a particular resource may lead to a general decline of wild populations, while continued demand results in a constant market value. In contrast, increasing scarcity may increase the costs of exploitation, driving market prices upwards, leading to a reduction in demand and possible substitution with another, more easily available, product (Homma 1992). However, in economic terms, the effects of unsustainable extraction are more subtle and not so easily detected (Hall and Bawa 1993). This is particularly the case for long-lived trees such as Brazil nuts (*Bertholletia excelsa*), in which low-impact harvesting of fruits can have uncertain impacts on regeneration (Ortiz 2002). Ecologically, harvesting can only be considered sustainable at the species level if it has no long-term deleterious effect on the reproduction and regeneration of the plant or animal populations being harvested (Chap. 7). In addition, harvesting should also not have any discernable adverse effect on other species within the community, or on ecosystem structure or function (Hall and Bawa 1993; Ticktin 2004). There are a number of authors who challenge that there can never be truly sustainable harvest of NTFPs (Hall and Bawa 1993; Redford and Stearman 1993;

Peters 1994; Struhsaker 1998) as the long-term impacts of harvesting may manifest themselves in a variety of ways, not all of which are fully understood or capable of being understood at an acceptable level of probability (Struhsaker 1998). While not immediately harmful, the harvesting of fruits and seeds can decrease the availability of food for frugivores as well as affect the future regeneration of a species (Hall and Bawa 1993). Hunting animals who predate and distribute seeds can lead to regeneration problems, or in the case of pollinator species a reduction in reproductive capacity can lead to, in extreme cases, an "empty" forest (Redford 1992). The harvesting of bark and other woody parts can cause short to long-term senescence and, ultimately, the death of the organism (Peters 1994; Ros-Tonen and Wiersum 2005). This situation is often aggravated by poor monitoring and enforcement of rules when they are in place, thus so-called sustainable practices are rarely adhered to (Ostrom 2009).

For forest products (including timber) sustainability can only be determined by directly measuring the rate of extraction with the rate of harvest (Godoy and Bawa 1993). Unfortunately few natural science studies have directly measured sustainability in this way (Chap. 7). As a result, there are few concrete examples of the measurable sustainable harvest of tropical forest products (Prance 1998). Dynamic data are needed on growth and mortality; data that are woefully incomplete for even the most-studied forest resources (Boot and Gullison 1995; Sunderland et al. 2004). The time period for such data to be useful is in the scale of years to tens of years. Unfortunately, this is a much longer time-frame than is available for most field workers with uncertain funding. Measures of sustainability are also hindered by a lack of appropriate inventory techniques for NTFPs (Wong et al. 2001). With such a diversity of living organisms and range of harvesting techniques and impacts, inventory methods required to assess sustainability of NTFPs are highly complex and hence are rarely implemented. Perhaps unsurprisingly, as a result of this knowledge gap, there are few forestry graduate courses that include formal training on NTFP ecology and management (Guariguata et al. 2008).

10.4 NTFPs, Protected Areas, and Conservation?

10.4.1 The Growth of Protected Areas and the Annexation of Forest Land

Although the assumption that nature is pristine and should be protected from use is commonly challenged (Willis et al. 2004, Chap. 7), protected areas remain the most commonly implemented means of formally conserving biodiversity and have been established in almost every country in the world (Chape et al. 2005; Coad et al. 2009). In response to the current biodiversity crisis, there has been an

exponential increase in the number of protected areas and, correspondingly, the area under protection in recent years (Chape et al. 2005). The global network of protected areas now covers 11.5% of the worlds surface area (Rodrigues et al. 2004) with 8.4% of the total protected area falling within categories I–IV of the IUCN's classification (Schmidt et al. 2009); the highest levels of protection. In theory, the majority of protected areas regulate and restrict access, denying millions of rural dwellers usufruct rights from forest lands they often previously relied upon for their livelihoods (Cernea 2005). If low-impact harvesting of NTFPs is seen as the optimum approach to land management in the tropics (Prance 1992), why has there been an exponential increase in protected area coverage and hence an annexation of land available for extractive activities? This contradiction could be explained as follows:

> "Although there has been much discussion suggesting that low-level economic activity would be compatible with biodiversity conservation, it is clear that if the full range of genetic, species and ecosystem diversity is to be maintained in its natural abundance on a given piece of land, then virtually any significant activity by humans must not be allowed" (Redford and Stearman 1993: 252).

This clear advocacy for the protection of "wild nature" (Willis et al. 2004: 402) in the absence of human activity continues to drive, and justify, the growth of protected areas in the tropics, despite the halcyon view that NTFP harvesting could be compatible with achieving conservation objectives; a contradiction within the conservation community that has seldom been acknowledged. In spite of their extensive coverage, protected areas have been relatively poor at conserving the full representative range of biodiversity (Rodrigues et al. 2004), and most of the world's biodiversity remains outside the protected areas, often in complex, multi-functional landscapes occupied by people (Alcorn 1993; Putz et al. 2001; Sayer and Maginnis 2005). It is these landscapes that are perhaps the most valuable for NTFPs and where they make their greatest contribution to rural livelihoods. Yet this requires a transition from natural forest to more intensively, and ultimately less diverse, forested systems, thus resulting in the conversion of biodiversity-rich natural forests (Fig 10.2).

Fig. 10.2 Making charcoal on the border of Bwindi Impenetrable National Park, Uganda (photo: Ross Shackleton)

10.4.2 The Transition from Natural Forests to Agro-Forests

Although highly diverse closed canopy forests can be important sources of forest products, a substantial proportion of NTFPs is harvested in secondary forest, farm fallows, and plantations (Ambrose-Oji 2003; Ros-Tonen and Wiersum 2005), which have been termed "domestic forests" (Michon 2005: 21). The peri-urban agroforests that supply the burgeoning NTFP economy of Belem are a good example of such forests (Shanley et al. 2002) (Fig 10.3). As are the domesticated forests of Indonesia, which supply up to 95% of fruits for the domestic markets as well as 80% of resin from Dipterocarpaceae trees (Michon 2005). Domestic forests are forested areas that contain trees that have been planted and can also include mosaics of natural forest as well as forest fields and fallow lands. Such agroforests are often mixed stands of trees cultivated for commercial purposes, usually NTFPs, rather than timber species.

One of the reasons why there is a strong transition from "nature to culture" (Dove 1995: 194; Levang et al. 2005) is that NTFPs in older, closed canopy forest are often present at very low densities (Peters 1994). As a result of the highly heterogenous nature of tropical forests, where individuals or stands of harvested species may be spread throughout a forested area, harvesters experience extremely low returns. For example, fruit production in the Peruvian Amazon (Phillips 1993) and resin and bark production in Indonesia (LaFrankie 1994) show remarkably low productivity levels per hectare, compared to timber and other land uses. Harvesting from such diverse environments requires an intimate and sophisticated knowledge of the forest, where each productive individual is known and monitored (Browder

Fig. 10.3 Joao Brito in Amazonia extracting medicinal bark from his family forest reserve for the treatment of diabetes. This species and other forest fruit trees are managed near urban markets to supply rising demand for NTFPs (photo: Trish Shanley)

1992a; Phillips 1993). Thus the trend is for greater intensification in managed forests.

Hence, NTFP extraction does not necessarily rely on a biodiverse resource base as there is a heavy reliance on only a very few major resources. Given the fact that such economic value is represented in relatively biodiversity-impoverished and often anthropogenic forests, what scope is there for the conservation of high biodiversity value forest using sustainable methods of NTFP extraction? Experience of the past 20 years probably suggests that the corresponding growth of alternative methods of conservation, such as protected areas (Hutton et al. 2005), is perhaps an indication of the limitations of sustainable NTFP harvesting being able to contribute realistically to biodiversity conservation.

10.5 Socio-Economic and Political Issues

10.5.1 Commercialisation: What Prospects for Conservation?

Underpinning the calls for the promotion and development of NTFPs is an assumption that increasing the commercial value of NTFPs will contribute to an increased appreciation of forests, therefore contributing both to poverty alleviation and forest conservation (Neumann and Hirsch 2000; Ruiz-Pérez 2005). However, historically, private capital or government intervention has played a part in the commodification of NTFPs (Dove 1995), and this process is only viable when there is a firm regional or global market for such products. It should be noted that colonial expansion was often driven by the commercialisation of many forest products (Hobhouse 1999) changing the face of not only the natural world, with large tracts of forest being cleared for the plantation-based production of cocoa, coffee, tea, rubber, etc. but also the introduction of a commodity-based economic system, based on short to medium-term financial returns, that is prevalent today (Brockway 2002).

Once commercialisation takes place and markets expand, elite capture occurs as the wealthiest in the community or region, or those able to invest in the expansion of trade, have adequate access to land and can invest in inputs required for cultivation and processing (Dove 1993; Marshall et al. 2003). Increasing demand for forest products initially leads to increased harvest from the wild, resulting in the loss of economic viability of the wild resource and encouraging the process of cultivation and ultimately, domestication (Homma 1992). Once cultivated systems are in place, the removal of an economically valuable product from the forest economy reduces the value of the standing forest leading to more lucrative, often destructive, land-use alternatives (Homma 1992). More recent assessments of NTFP commercialisation have concurred with these earlier studies and concluded that, while there are certainly local livelihood benefits (Marshall et al. 2003), such schemes are unlikely to be a successful means of ensuring wider biodiversity conservation for the reasons detailed above (Belcher and Schreckenberg 2007).

Underpinning the complexities of commercialisation and therefore the ability of NTFPs to provide an economic incentive to forest conservation is the fact that such a trade is often part of the informal forestry sector or the "hidden harvest" (Scoones et al. 1992: 17). Formalising the harvest and sale of NTFPs such that revenues contribute to the formal forestry sector is an oft-forgotten issue in NTFP research, and their near absence from the policy agenda (Laird et al. 2010).

10.5.2 Tenure, Politics, and Culture

To ensure that any modicum of sustainability in NTFP harvest, land, and resource tenure is critical Without secure tenure, open-access harvesting of an important commodity will almost certainly guarantee resource depletion (Angelsen and Wunder 2003). Where land and resource tenures are uncertain, many local people choose production systems that maximise short-term yield at the cost of long-term sustainability, such as the production of annual crops. This is a particular problem where landless migrants inhabit a forest area, such as Amazonia (Browder 1992b) and Indonesia (Levang et al. 2007), where short-term livelihood strategies take precedence over more sustainable land use practices. In short, it could be argued that more sustainable production systems would be more attractive to rural communities if they could gain *in perpetuo* rights to their land.

Unfortunately, many NTFP production systems operate within open or semi-open access systems of resource tenure, often resulting in mining of a resource if it is of particular economic value. It has been noted that rapid market expansion of products with little or no tenurial security often leads to significant over-harvesting (Alcorn 1995). The case of rattan in Indonesia is a good example of how fast-growing markets and open-access combine to compromise long-term conservation goals (Belcher et al. 2004). However, even if the open-access problems that lead to destructive harvesting were resolved, increases in the value of NTFPs might not benefit the conservation of tropical forests or the livelihoods of their inhabitants (Southgate et al. 1996). The reason given for this partly historical observation is that, as discussed earlier in this chapter, as extractive commodity becomes scarce, cultivation outside the natural ecosystem has been a characteristic response to its subsequent depletion in the wild. However, often such intensification efforts exclude the original resource users with the majority of resultant profits accruing to local élites, commercial concerns, or the state (Dove 1993; Marshall et al. 2003).

One additional tenurial problem relates to the interplay between customary and statutory legislative frameworks. For most of Africa, for example, governments have de jure control of land and can impose often contradictory land use policies over the same areas (e.g., mining concessions being issued within protected areas in Gabon). Overlapping layers of class, education, elite, and statutory "rights" overlying basic traditional tenure systems will affect the way innovations and management options are implemented, and together these relationships will play a direct

role in successes or failures related to biodiversity conservation and livelihood improvement, not just for NTFPs but for other natural resources as well.

Political issues related to power and resource control may play an important role in determining sustainable management of forests and their resources than biological factors. The initial establishment of extractive reserves in Brazil was certainly driven more by socio-political issues than ecological considerations (Richards 1993). Yet studies show that extractive reserves and other models of sustainable use require strongly hierarchical political-economic systems (Dove 1995) which often promote inequity (Browder 1992b). Dove (1995) describes how the development of the rubber economies in Amazonia and Brazil has resulted in very different conservation and livelihood outcomes due to dissimilar historical trajectories based on socio-political differences on each region and suggests that the promotion of NTFPs is as much a political challenge as a technological or economic one.

Indigenous NTFP management systems have often imparted controls on the over-harvesting of many products (Redford and Stearman 1993), yet traditional knowledge systems often break down during a transition from subsistence economies to sedentary agriculture and exposure to modern communications and schooling (Ros-Tonen and Wiersum 2005). Conflicts within communities over whether traditional patterns of resource harvesting are able to provide for modern development needs such as health care, education, market access, etc. have taken place throughout the tropics, particularly between the youth and more established traditional institutions, often leading to a breakdown of traditional controls over resource use and management. Mythologising the role of indigenous people in natural resource management or denying them due societal and economic development and possible routes out of poverty, which may result from unsustainable resource exploitation, would be a significant disservice. Indeed, the long-held assumption that local people are inherent conservationists has also been questioned (Redford and Stearman 1993), as a lack of secure land and resource tenure does not encourage resource sustainability, and resource depletion is often a characteristic of NTFP production systems. For example, research conducted in Cameroon concludes that even for economically valuable NTFPs, few management techniques are applied under traditional harvest practices (Malleson 1999).

10.6 Discussion

Despite early optimism that the sustainable harvest of NTFPs was the silver bullet to save the tropical forests, it has become increasingly clear over the past 20 years that the assumptions underpinning this paradigm were based on somewhat simplistic, and generalised, approaches. Although, as we have discussed, NTFPs play a significant role in rural livelihoods, it has been argued that this is often in instances when there are few economic alternatives available (Ros-Tonen and Wiersum 2005; Shackleton et al. 2007). Hence, a major assumption that needs to

be questioned is related to the "real" value of NTFPs to local people, and whether such value is reflected in the sustainable management of wild resources. In general, it is often the very poorest who primarily rely on forest products for their livelihoods (Alcorn 1993; Paumgarten and Shackleton 2009). This is because the NTFP sector is characterised by low or medium returns on labour, low capital, and skills requirements and subject to open or semi-open resource access: a reflection of the development characteristics of forested landscapes (Angelsen and Wunder 2003). For many rural communities, in the absence of access to skilled labour, markets, political power or credit, NTFP harvest and trade becomes increasingly important. As such, NTFPs provide safety nets, whereby the benefits provided by forest resources stop rural dwellers from becoming poorer and provide cash income at critical times of the year, particularly during times of low agricultural production (Angelsen and Wunder 2003; Ros-Tonen and Wiersum 2005, Chap. 3). When products become commoditised and highly profitable, few material benefits trickle down to the primary producer (Dove 1993, 1995; Marshall et al. 2003). In the context of extractive reserves in Brazil, Fearnside (1989: 388) writes: "when the value of trade accrues to intermediaries, extractivists remain poor, no matter how much wealth they generate" This scenario is often mirrored elsewhere in the tropics and is the reason why, in some instances, NTFPs are regarded as "poverty traps" (Angelsen and Wunder 2003: 21). Given the often low returns from NTFPs, studies of livelihood trajectories suggest that given alternatives to NTFP production, most people will prefer to practice intensive agriculture and become involved in wage labour, rather than rely on the forest alone (Levang et al. 2007; Paumgarten and Shackleton 2009). This further compromises the potential for the sustainable harvest of NTFPs to contribute directly to biodiversity conservation as agricultural expansion is a leading driver of forest loss.

Again, questioning the assumption that NTFP harvesting is inherently sustainable, there is considerable evidence that long-term harvesting of any non-timber forest product often results in resource depletion (Peters 1994; Ticktin 2004). Responses to depletion include exclusion through statutory or customary controls, other forms of legal control (tariffs and harvesting quotas), cultivation, and ex situ conservation (Hamilton 2008). However, from the perspective of the rural harvester, two local responses to scarcity are also common: (1) increasing the harvest range and (2) substitution (Cunningham 2000). In both the instances, it is important to note the weak link between biodiversity conservation and NTFP harvesting. In essence, the evidence suggests that resources will be utilised until they become scarce, and then either alternative sources are identified or the raw materials are substituted with more readily available materials:

- *Increased harvesting range*: a typical first response to resource scarcity is to increase the harvest range (Cunningham 2000). However, it is commonly found that local harvesters do not factor in the increased opportunity costs of the additional labour needed to collect these resources from a greater distance and that the "*payment received by households [for NTFPs] barely covers the opportunity cost of labour employed in harvesting*" (Southgate et al. 1996: 1).

As the demand for some products continues to expand, this response will undoubtedly lead to further scarcity and local extirpation.

- *Substitution*: in a number of instances, when a preferred species becomes scarce due to over-harvesting, a similar product is utilised in its place. For example, rattan baskets and other products are being replaced in rural African societies with synthetic substitutes due to resource depletion. The same occurs in the case of woodcarving, where indigenous species that have become overexploited are being replaced with fast-growing indigenous or, latterly, exotic species, particularly to supply the thriving Kenyan and Zimbabwean woodcarving industries.

More recent attempts to couple NTFP extraction with environmental and social responsibility through schemes such as fair trade and certification remain somewhat incipient (Shanley et al. 2008) and are hindered by the very issues discussed earlier in this chapter: lack of tenure security, elite capture, insufficient monitoring capacity, poor management capacity, and low levels of organisation among producers. It will take considerable effort and expertise, if not a complete paradigm shift, to make such schemes effective if they are to contribute to both biodiversity conservation and local livelihoods.

The conditions that could foster the sustainable harvest of NTFPs, secure property rights, low population densities, customary rule of use, and simple technologies, all seem to encourage more intensively managed systems *outside* highly biodiverse forested systems. This may be just as well as the growing network of global protected areas is essentially excluding access rights to many forest dwellers who rely on NTFPs for their livelihoods. As opposed to creating more protected areas, biodiversity could perhaps be better conserved through the sustainable use of resources in multi-strata, multi-functional landscapes (Putz et al. 2001). However, the complexities of such land-use planning, management and monitoring required to ensure compliance and for the required, and often intricate, management systems to be in place for such landscapes seem thus far insurmountable, and there remain few examples of holistic landscape scale management that provide optimum outcomes for both conservation and development (Sayer and Maginnis 2005).

Although the academic world has begun to realise the limitations of the NTFP sector and has recently been more sanguine in re-assessing this potential (Chap. 3), NTFP promotion and development remain a mainstay of many site-level projects. This disjunction provides an excellent example of a lack of communication between conservation practice and academia, recently discussed by Sunderland et al. (2009), and the same attempts at NTFP development and promotion continue to be made across the tropics as a tool to support forest conservation, albeit with very questionable outcomes for either conservation or local livelihood development.

In summary, despite the laudable and significant efforts at establishing extractive systems of NTFPs that foster the conservation of highly biodiverse forested systems, insufficient evidence has been offered over the past 20 years to suggest this is a feasible land-use option. Indeed, the fact that the primary approach to biodiversity conservation has focused on the establishment of protected areas that exclude local access for the harvest of forest products suggests that confidence in the ability of

sustainable NTFP extraction to meaningfully contribute to conservation is relatively low. NTFP management as a component of complex landscapes, as we have discussed, can certainly play a role in contributing to more diverse production systems, but the potential for NTFPs to provide a singular solution to the on-going biodiversity crisis should be severely tempered. The common tendency to embrace simple solutions to complex problems and pursue what are essentially fads [be it NTFPs, debt-for-nature swaps, green marketing, payments for environmental services and probably, the next big thing, Reduced Emissions from Deforestation and Degradation (REDD)] needs to be replaced with a more holistic, long-term, multi-disciplinary, and equitable approach to integrating human needs and biodiversity conservation.

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